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Remarks

Claims 1-30 are pending in the application.

Claims 1, 4 and 10 are objected to because of various informalities.

Claims 1, 10, 15, 24, 27, and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (U.S. Patent #6,650,846) in view of Tonello (U.S. Patent #6,480,552).

Claims 2-4 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Fujiwara et al. (US PGPub 2003/0161638).

Claims 5-9, 12-13, 18-23, 25-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Yao (U.S. Patent #5,654,818).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Munks et al. (U.S. Patent #6,842,287).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Yao and further in view of Munks et al.

By this amendment, Applicants have amended claims 24 and 28-29 to clarify Applicants' invention. No new matter has been added.

Each of the various rejections and objections are overcome by amendments that are made to the specification, drawing, and/or claims, as well as, or in the alternative, by various arguments that are presented.

Any amendments to any claim for reasons other than as expressly recited herein as being for the purpose of distinguishing such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim expressly made in order to distinguish such claim from known prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel

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and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any dependent claims that have been herein rewritten in independent form is exactly the same as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewriting to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Objection to Claims 1, 4 and 10

Claims 1, 4 and 10 are objected to "because they recite terminology of proximity (i.e., the term "substantially")." The Examiner finds that "[t]he phrase, 'substantially orthogonal', does not clearly define the state of polarization between successive bits."

Applicants respectfully submit that the use of the term "substantially", in conjunction with another term, has been accepted in claim drafting to describe a particular characteristic that is, for example, "largely but not wholly that which is specified", as defined by Webster's Ninth New Collegiate Dictionary 1176 (9th Ed. 1983). Such claim terminology does not render the claim indefinite (see, for example, MPEP 2173.05(b), p.2100-216, Rev. 5, Aug. 2006; and Chisum, §18.07[2], Rel.87-3/03).

As used in claims 1, 4 and 10, Applicants submit that one skilled in the art would know what is meant by "substantially orthogonal". As such, it is respectfully requested that the objection of claims 1, 4 and 10 be withdrawn.

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Rejection Under 35 U.S.C. 103(a)**Claims 1, 10, 15, 24, 27, and 29-30**

Claims 1, 10, 15, 24, 27, and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello. The rejection is traversed.

Independent claims 24 and 29 have been amended to clarify Applicants' invention. No new matter has been added.

Applicants' independent claims 1, 15, 27 and 30 are directed to various aspects of alternate polarization-phase shift keying (APol-PSK) transmission, while independent claims 10, 24 and 29 are directed to various aspects of APol-differential phase shift keying (APol-DPSK). Each of these claims recites features of polarization alternation and respectively, PSK or DPSK, to either generate an APol-PSK signal as in claims 1 and 30, or generate an APol-DPSK signal as in claim 10, or "a polarization alternator optically coupled to the data modulator to provide polarization alternation of the output of the data modulator" as in claims 15, 24, 27 and 29. As set forth below, the combined teaching of Ito and Tonello does not teach or suggest at least these claimed features.

As Examiner indicated, Ito does not teach optically encoding data using PSK. Thus, Tonello is cited for teaching a modulator capable of performing PSK or DPSK, and Examiner's position is that it would be obvious to modify Ito's phase modulator 3 (Figure 13) to provide data encoding with PSK or DPSK.

Applicants respectfully disagree, because not only is there no motivation or suggestion to combine Ito with Tonello to perform PSK or DPSK, but even if combined, it would not have resulted in Applicants' claimed invention.

Ito's teaching is directed to an optical transmitter to sufficiently suppress waveform degradation caused by self-phase modulation and group velocity dispersion (SPM-GVD) effect (e.g., Summary of the Invention, col. 2, lines 7-10; col. 10, lines 39-44). Ito's Fig. 13 teaches intensity modulation of NRZ data, while "the phase modulator 3 modulates the phase of the intensity-modulated signal based on a bit rate frequency sine wave 105 corresponding to the bit rate frequency of the signal" (col. 10, lines 21-24).

Thus, the sole function of Ito's phase modulator 3 is to apply a bit-synchronized phase modulation, or prechirp, to an intensity-modulated optical signal as part of a

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scheme to further suppress waveform degradation caused by the SPM-GVD effects (e.g., col. 10, lines 35-43). Throughout Ito's discussions of various embodiments, Ito consistently teaches that data encoding is done by intensity modulation, and that phase modulation is performed based on a bit-rate frequency sine wave.

In other words, Ito never intended phase modulator 3 to be used for data encoding. In fact, in Ito's apparatus, the phase modulator 3 must be modulated with a sine wave in order to introduce a pre-chirp that is identical for all the bits.

Even if Ito's phase modulator 3 were to be modified to perform data encoding, as suggested by the Examiner, the resulting modulation format would have both amplitude modulation (from intensity modulator 2) and phase modulation, with alternate polarization from bit-to-bit. Not only would such a modification defeat the intended purpose of Ito's invention, but the resulting method or apparatus is also different from Applicants' claimed invention.

As such, Applicants submit that there is no motivation for modifying the data encoding in Ito from intensity modulation to PSK or DPSK by combining with Tonello.

As for independent claims 10, 24 and 29, Applicants further submit that neither Ito's Fig. 13, nor Tonello's modulator, teaches or suggests "modulating the output of an optical source using the precoded electronic data signal and differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal", as recited in claim 10 (emphasis added); or "wherein electronic data to be transmitted is optically encoded by the data modulator as phase shift keying between two optical bits separated by an even number of bit periods", as recited in claims 24 and 29, respectively (emphasis added).

Furthermore, contrary to Examiner's assertion, the precoding or precoder device in Applicants' claims 10, 24 and 29 are also different from intensity modulation performed by intensity modulator 2 in Ito's Figure 13. Specifically, Applicants' precoding is performed on an electronic signal, whereas Ito's intensity modulation is performed on an optical signal. For at least the above reasons, claims 10, 24 and 29 are not obvious over the combined teachings of Ito and Tonello.

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As such, independent claims 1, 10, 15, 24, 27 and 29-30 are allowable over Ito in view of Tonello under 35 U.S.C. 103. Therefore, Applicants respectfully request that the rejection be withdrawn.

Claims 2-4 and 16-17

Claims 2-4 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Fujiwara. The rejection is traversed.

Each ground of rejection applies only to dependent claims, and each is predicated on the validity of the rejection under 35 U.S.C. 103 given Ito in view of Tonello. Since the rejection under 35 U.S.C. 103 given Ito in view of Tonello has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Fujiwara supplies that which is missing from Ito in view of Tonello to render the independent claims obvious, these grounds of rejection cannot be maintained.

As such, claims 2-4 and 16-17 are allowable over Ito in view of Tonello and further in view of Fujiwara under 35 U.S.C. 103. Therefore the rejection should be withdrawn.

Claims 5-9, 12-13, 18-23, 25-26 and 28

Claims 5-9, 12-13, 18-23, 25-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Yao (U.S. Patent #5,654,818). The rejection is traversed.

Independent claim 28 has been amended to clarify Applicants' invention. No new matter has been added.

Independent claim 9 recites "using an electronic data signal to drive a Mach-Zehnder modulator having a polarization rotation device in at least one arm to provide simultaneous polarization alternation and optical data encoding by phase shift keying to generate an APol-PSK signal." (emphasis added)

Contrary to page 11 of the Office Action, Ito's Fig. 13 does not teach simultaneous polarization alternation and data encoding by PSK, as provided in claim 9. As set forth above, Ito teaches only intensity modulation of NRZ data, but not PSK or

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DPSK, and there is no motivation to combine Ito with Tonello because the resulting combination would have defeated the intended purpose of Ito.

Furthermore, there is no teaching or suggestion in Tonello (modulator 106) or Yao (Fig. 4) of any MZ modulator to provide simultaneous polarization alternation and data encoding by PSK. For example, even though the Yao's MZ modulator in Fig. 4 shows a polarization rotator 52 in one arm, there is no teaching in Yao that the either of the MZ modulators 22 or 24 (driven by signal source 20) provides simultaneous alternating polarization and data encoding using PSK.

Absent any suggestions in Ito, Tonello or Yao, the simultaneous polarization alternation and data encoding by PSK or DPSK is merely impermissible hindsight derived from the teaching from Applicants' invention. Furthermore, even if combined, Ito, Tonello and Yao would not have resulted in Applicants' claim 9, because Yao's MZ modulator does not provide simultaneous polarization alternation and PSK encoding.

Independent claim 12 recites, in part: "using the precoded electronic data signal to drive a Mach-Zehnder modulator including a polarization rotation device in at least one arm to provide simultaneous polarization alternation and optical data encoding by phase shift keying between two optical bits separated by an even number of bit periods to generate an APol-DPSK signal."

As set forth above, the combination of Ito, Tonello and Yao does not teach any Mach-Zehnder modulator having a polarization rotation device to provide simultaneous polarization alternation and data encoding by PSK, or the simultaneous encoding and polarization alternation between two optical bits separated by an even number of bit periods, as provided in claim 12. Furthermore, the combined teaching of Ito, Tonello and Yao does not teach precoding of electronic data signal, as provided in claim 12.

As such independent claim 12 is not obvious over Ito, Tonello and Yao, either singly or in combination.

Independent claims 25-26 and 28 each recites similar features of a MZ modulator or modulator means to simultancously provide polarization alternation and data encoding using PSK. For the same reasons set forth above, these claims are also not obvious over Ito, Tonello and Yao, either singly or in combination.

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Finally, as discussed above, Ito and Tonello, alone or in combination, fail to teach or suggest all of the limitations recited in independent claims 1 and 15, and thus, fail to teach or suggest Applicants' invention as a whole. Since the deficiency in Ito and Tonello is not remedied by Yao, the combination of Ito, Tonello and Yao also does not render obvious independent claim 1 or claim 15.

Claims 5-8 and 18-23 depend, either directly or indirectly from claim 1 or claim 15, and recite additional features. For the same reasons set forth above, these claims are also patentable over the combination of Ito, Tonello and Yao.

Therefore, Applicants respectfully request that the rejection of Claims 5-9, 12-13, 18-23, 25-26 and 28 be withdrawn.

Claim 11

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Munks et al. The rejection is traversed.

Claim 11 depends from independent claim 10, and recites additional features. Since the rejection of claim 10 under 35 U.S.C. 103 given Ito in view of Tonello has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Munks et al. supplies that which is missing from Ito in view of Tonello to render independent claim 10 obvious, this ground of rejection of claim 11 cannot be maintained.

As such, claim 11 is patentable over Ito in view of Tonello and further in view of Munks et al. under 35 U.S.C. 103. Therefore, the rejection should be withdrawn.

Claim 14

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito in view of Tonello and further in view of Yao and further in view of Munks et al. The rejection is traversed.

Claim 14 depends from independent claim 12, and recites additional features. Since the rejection of claim 12 under 35 U.S.C. 103 given Ito in view of Tonello and further in view of Yao has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Munks et al. supplies that which is missing

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from Ito in view of Tonello and further in view of Yao to render independent claim 12 obvious, this ground of rejection cannot be maintained..

As such, claim 14 is patentable over Ito in view of Tonello and further in view of Yao and further in view of Munks et al. under 35 U.S.C. 103. Therefore the rejection should be withdrawn.

Secondary References

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to Applicants' disclosure than the primary references cited in the Office Action. Therefore, Applicants believe that a detailed discussion of the secondary references is not necessary for a full and complete response to this Office Action.

Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 530-9404 so that arrangements may be made to discuss and resolve any such issues.

Respectfully submitted,

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